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Feature

Digital Health Technology Shows Promise for Efforts To Address Drinking Among Youth

Underage drinking and alcohol misuse by young adults are serious public health concerns in the United States. The 2022 National Survey on Drug Use and Health (NSDUH) found that 15.1% of people ages 12 to 20 and 50.2% of people ages 18 to 25 reported drinking alcohol in the past month, with 8.2% of 12- to 20-year-olds and 29.5% of 18- to 25-year-olds reporting binge drinking in the past month.[1,2] Surveys also consistently find that young people are among the biggest users of the internet and mobile devices.

"There is an urgent need for innovative interventions to prevent alcohol misuse among our nation's young people," said National Institute on Alcohol Abuse and Alcoholism (NIAAA) Director George F. Koob, Ph.D. "Internet and mobile technologies have the potential to significantly expand our prevention efforts."

In December 2023, NIAAA held a webinar, "Harnessing Technology and Social Media to Address Alcohol Misuse in Adolescents and Emerging Adults," featuring NIAAA-supported research conducted by Maureen Walton, M.P.H., Ph.D., of the University of Michigan and Mai-Ly Steers, Ph.D., of Duquesne University.

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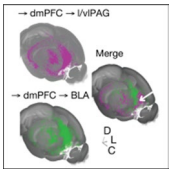

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In her talk titled "Optimizing Prevention of Alcohol Misuse and Violence Among Adolescents and Emerging Adults," Dr. Walton discussed the importance of early interventions and how strategies that address multiple factors simultaneously may be more effective in preventing alcohol misuse over time. She also emphasized the potential benefits of more selective alcohol prevention interventions for youth at risk for binge drinking, as opposed to universal interventions that are designed to reach a broader age group.

Dr. Walton, Rebecca Cunningham, M.D., and colleagues previously developed SafERteens. SafERteens is a single-session, motivational interview-based intervention delivered by a therapist to youth ages 14 to 18 during an emergency department visit for a medical illness or injury. The researchers found that alcohol-related consequences and severe aggression were reduced in the year following the intervention.

Dr. Walton's team has expanded SafERteens to include digital boosters such as telehealth sessions with a health coach and text messages to reduce violence and alcohol misuse. Preliminary data from a recent study show that participants who received SafERteens plus digital boosters reduced their alcohol consumption, their involvement with violence, and the consequences associated with alcohol use and violence over the course of the study.

"Digital technology is an exciting and feasible way to extend interventions and prevention to youth in real time in their daily lives," said Dr. Walton.

In her talk, "Social Media Use—Friend or Foe? How It Has Been Problematic Yet Holds Promise for Addressing College Drinking," Dr. Steers discussed the relationship between social media and alcohol consumption, particularly among college students. Although much about social media's influence on alcohol use is unknown, research has consistently found a link between young people's exposure to alcohol-related social media posts and their alcohol consumption and related problems. Alcohol-related social media posts by young people have also been found to be robust predictors of alcohol consumption and problems.

Dr. Steers and her colleagues are examining factors that influence young people's susceptibility to alcohol-related social media content and the individual differences that affect their drinking patterns. The researchers have found that some of the main reasons that college students who drink post alcohol-related content on social media are to obtain attention and approval from their peers and to convey status or popularity. In addition, exposure to other people's alcohol-related content may normalize drinking and portray it as socially rewarding, both of which can in turn influence a student's alcohol consumption.

Although social media is linked to increased alcohol misuse, it also holds promise for addressing alcohol misuse among college students. Dr. Steers and her team are working to develop novel interventions targeting students ages 18 to 26 who drink excessively and who are also avid social media users. As a step toward a more standardized measure for research, her team created an alcohol-related content and drinking scale in which students use their alcohol-related posting behavior to recall their drinking retrospectively. The researchers are using this tool within the context of personalized normative feedback—a brief intervention that

corrects perceptions of normal behavior—by giving people feedback on their self-reported drinking and their perceptions of how much they think their peers drink.

"Given that we know for sure that social media is a major source of social influence, future research should really try to leverage it as a tool to promote the reduction of drinking," said Dr. Steers.

Dr. Koob added, "Digital technology offers a path into people's daily lives and can reach people where they are and on their terms. Therefore, it provides opportunities to reach broader segments of society, from people who are reluctant to get help for an alcohol problem to youth who may be at risk for initiating or escalating alcohol use."

NIAAA also supports a variety of other studies that are leveraging social media and other technologies to develop novel alcohol prevention and treatment interventions for youth. Such studies include:

- Developing social media-inspired games to help reset perceptions of normal behaviors surrounding alcohol
- Expanding use of existing mobile phone-based apps to reduce alcohol-related sexual assault on college campuses as well as to reduce alcohol use and post-traumatic stress disorder after sexual assault
- Using virtual reality to provide insight into alcohol's effects on behavior

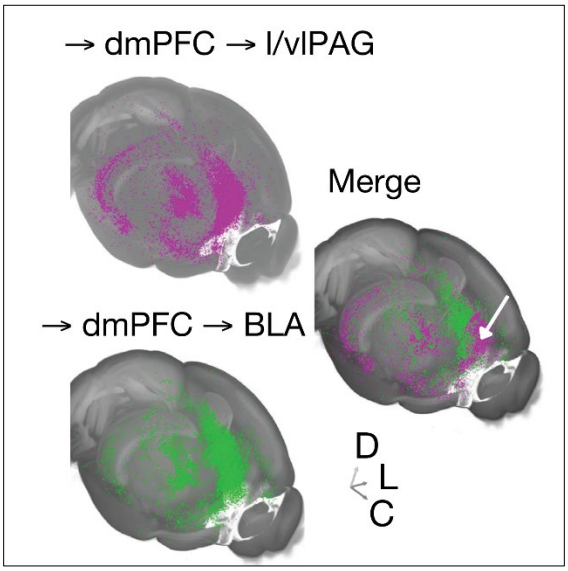
References:

[1] Substance Abuse and Mental Health Services Administration (SAMHSA), Center for Behavioral Health Statistics and Quality. 2022 National Survey on Drug Use and Health. Table 2.27B—alcohol use in past month: among people aged 12 or older; by age group and demographic characteristics, percentages, 2021 and 2022. [cited 2023 Dec 8]. Available from: https://www.samhsa.gov/data/sites/default/files/reports/rpt42728/NSDUHDetailedTabs2022/NSDUHDetailedTabs2022/NSDUHDetTabsSect2pe2022.htm#tab2.27b

[2] SAMHSA, Center for Behavioral Health Statistics and Quality. 2022 National Survey on Drug Use and Health. Table 2.28B—binge alcohol use in past month: among people aged 12 or older; by age group and demographic characteristics, percentages, 2021 and 2022. [cited 2023 Dec 8]. Available from: https://www.samhsa.gov/data/sites/default/files/reports/rpt42728/NSDUHDetailedTabs2022/NSDUHDetailedTabs2022/NSDUHDetTabsSect2pe2022.htm#tab2.28b

News From the Field

Scientists Find Brain Pathways for Threat Response in Mice



This mouse brain diagram shows how rabies virus tracing reveals neural pathways from the dmPFC to the periaqueductal gray (purple) and the dmPFC to the amygdala (green) to merge in the prefrontal cortex (white arrow) to coordinate learning about potential threats. Silverstein et al. A distinct cortical code for socially learned threat. Figure 4B. Nature 2024 Feb;626(8001):1066-1072. Reused with permission.

Scientists at the National Institute on Alcohol Abuse and Alcoholism (NIAAA) have identified brain pathways that may coordinate an animal's response to potentially traumatic situations. Understanding where and how neural circuits mediate such functions—and how they could malfunction—may provide clues about their role in trauma-related and stress-related psychiatric disorders in people. A report of this NIAAA research was published in the journal Nature.

"Experiencing or witnessing traumatic events is often at the root of trauma-related and stress-related psychiatric conditions including alcohol use disorder," said the study's senior author, Andrew Holmes, Ph.D., senior investigator in NIAAA's Laboratory of Behavioral and Genomic Neuroscience. "In animal models of stress and trauma, learning about potential sources of threat by observing how others deal with danger can be an effective way to avoid harm. Understanding the differences in how the brain processes direct experience of a threat compared to observing another's response to a threat may shed light on factors that predispose humans to trauma- and stress-related psychiatric disorders."

In their study, Dr. Holmes and his colleagues examined the neural basis of observational fear learning (OFL) in mice. OFL is the process through which animals learn about sources of danger and minimize their own risk by observing how others respond to threats. The researchers focused on an area at the front of the brain called the dorsomedial prefrontal cortex (dmPFC), which is known to play key roles in processing social information and interpreting threats in mice, humans, and other animals. The researchers found that the dmPFC is recruited and required for OFL in mice.

Then the researchers measured activity of neural pathways leading to and away from the dmPFC in mice that watched other mice learn to associate a sound cue with a mild foot shock. Animals that receive this cue-shock pairing typically learn to "freeze" or become motionless when they hear the sound cue. The scientists then presented the observer mice with the sound cue-foot shock pairing and measured activity in the same dmPFC neural pathways.

The researchers found that when observer mice faced the "threat" of the sound cue, they showed a coordinated activation of pathways that either mobilized or suppressed the freezing

response. For example, the observer mice showed that dmPFC projections to the midbrain periaqueductal gray (PAG) regulate OFL and that amygdalar and hippocampal inputs to the dmPFC opposingly modulate observer freezing. Hippocampal inputs constrained, whereas basolateral amygdala inputs promoted freezing in observer mice.

The researchers hypothesized that a critical function of the dmPFC in the observer mice may be to balance the need to minimize harm (i.e., freezing) with the need to fulfill other essential survival functions (e.g., assessing risk or comforting others).

The researchers also said that the findings suggest that maladaptive responses to socially learned threats could arise in part from deficits in the dmPFC pathways and may point to a potential role of the dmPFC deficits in trauma- and stress-related psychiatric disorders in humans.

Reference:

Silverstein SE, O'Sullivan R, Bukalo O, Pati D, Schaffer JA, Limoges A, Zsembik L, Yoshida T, O'Malley JJ, Paletzki RF, Lieberman AG, Nonaka M, Deisseroth K, Gerfen CR, Penzo MA, Kash TL, Holmes A. A distinct cortical code for socially learned threat. Nature. 2024 Feb;626(8001):1066-1072. PubMed PMID: 38326610

Noteworthy

National Institute on Alcohol Abuse and Alcoholism Announces Content on Global Learning Platform Kahoot!

The National Institutes of Health (NIH) has partnered with the global online learning platform Kahoot! to provide free interactive quizzes and games for educators and learners. NIH's Kahoot! page has grown to feature content on teen depression, superbugs, health literacy, lung health, and other health topics.

The National Institute on Alcohol Abuse and Alcoholism (NIAAA) recently joined the NIH Kahoot! site with a quiz about how alcohol affects a teen's health. Now high schoolers, at home or in the classroom, can learn how alcohol affects the teen brain and body by taking NIAAA's Kahoot! quiz about underage drinking. The quiz is designed to help students understand the negative health consequences associated with drinking, the signs of an alcohol problem, and how teens can find support for friends, family, or themselves.

The Kahoot! quiz is just one of a number of resources NIAAA has developed to help students, educators, and parents learn about underage drinking. These resources are all available via NIAAA's Underage Drinking landing page for easy, one-stop access and include:

- Facts About Teen Drinking website
- NIAAA for Middle School online resource (see the Winter 2024 Spectrum issue to learn more)
- Alcohol and Your Brain virtual reality experience (see the Fall 2023 Spectrum issue to learn more)
- Short Takes with NIAAA videos: How Does Alcohol Affect the Adolescent Brain? and What Are the Dangers of Underage Drinking?

Noteworthy

Alcohol Research: Current Reviews Celebrates Its 50th Anniversary

This year marks the 50th anniversary of Alcohol Research: Current Reviews (ARCR). ARCR is an open-access, peer-reviewed journal published by the National Institute on Alcohol Abuse and Alcoholism (NIAAA) at the National Institutes of Health. Open-access journals are available without barriers such as fees.

Although this journal has evolved over time, its mission remains unchanged. ARCR is committed to making scientific developments accessible to alcohol researchers and other interested audiences, such as health care practitioners, educators, and policymakers.

ARCR's influence, measured by its current Journal Impact Factor™ of 9.4, has risen steadily over the years. ARCR now ranks first among 38 journals in the Social Sciences Citation Index "substance abuse" category.

NIAAA first published its journal in 1974 as an experimental issue called Alcohol Health & Research World. The journal changed its name to Alcohol Research & Health in 1999 and then to the current Alcohol Reviews: Current Research title in 2012.

And while earlier editions contained primary research, the journal now focuses exclusively on review articles. For information about how to access all previous issues of the journal, visit the About ARCR webpage.

ARCR will celebrate its 50th anniversary throughout 2024 with updates about the journal and its history, highlighting the journal's major milestones. You can stay posted by:

- Subscribing to this email listserv, which shares ARCR updates, including new article releases
- Following and engaging with the ARCR LinkedIn account
- Checking the ARCR News & Notes webpage often for anniversary-related content and other breaking updates shared by ARCR

Five Questions With ...

Paule V. Joseph, CRNP, Ph.D., Acting Chief of the Section of Sensory Science and Metabolism, National Institute on Alcohol Abuse and Alcoholism, Co-Director of the National Taste and Smell Center at the National Institutes of Health

1. *Please tell us about your research, which you conduct for two institutes at the National Institutes of (NIH). Why do you study taste and smell in the context of alcohol problems?*

I am a nurse scientist with the National Institute on Alcohol Abuse and Alcoholism and the National Institute of Nursing Research. My research bridges nursing, sensory science, and behavioral health. My research agenda is shaped by a profound interest in how sensory experiences—particularly those related to taste and smell—can significantly affect our health, influence eating and drinking behaviors, and contribute to the development and progression of metabolic diseases and alcohol use disorder (AUD).

My journey into this research is rooted in an innate curiosity about the sensory experiences that define interactions with the world around us. As a nurse, I often observed how important smell is, especially when assessing infection in patients. In my interactions with patients receiving weight loss surgery, people often told me how food didn't taste the same. I also noted that after their procedures, some patients later developed AUD.

I went on to pursue doctoral training, in which I explored the intersection of sensory science and health care. Later, I joined NIH, driven by a desire to conduct comprehensive research to understand and harness the power of taste and smell.

Today, in addition to advancing scientific knowledge, I hope to challenge and change prevailing biases in a world predominantly focused on vision and hearing. I believe the primordial senses—often ignored or forgotten—hold the key to unlocking new dimensions in

health care, offering novel approaches to prevention, treatment, and rehabilitation. Through an increased understanding of the sensory alterations experienced by those with AUD, I aim to uncover targeted strategies that could significantly affect treatment and recovery. It's about unlocking the potential for personalized interventions that can lead to better health outcomes.

2. *What are some of your recent project highlights?*

One highlight includes a study that is delving into how alcohol consumption behaviors can alter taste and smell, potentially leading to or exacerbating AUD. Our work includes:

- Developing a novel method for measuring human taste and smell, including the remote chemosensory tests in a mobile ecological toolkit
- Examining the impact of diet on taste
- Exploring how taste and smell are affected by alcohol use
- Characterizing the loss of taste and smell in patients with COVID-19 and long COVID

Currently, we are leveraging virtual reality and other innovative technologies for our studies. In June 2024, we will launch the National Taste and Smell Center—a joint effort with the National Institute on Deafness and Communication Disorders and supported by additional NIH components. Finally, we are developing novel interventions aimed at curtailing unhealthy eating and drinking patterns, particularly in populations at risk of health disparities.

3. *What are some key messages you wish to highlight, and how do you go about reaching audiences?*

A cornerstone of my mission is to highlight the pivotal role that our senses play in overall well-being. Changes in our ability to taste and smell affect our enjoyment of food and drink and can have profound implications for health. In particular, I seek to educate the public and health care professionals by emphasizing the significance of olfactory experiences in our interactions with alcohol, encouraging a more holistic view of sensory health.

My goal is to promote more informed choices for health and encourage the consideration of olfactory factors in both clinical and personal contexts related to alcohol misuse. In addition to academic publications and public lectures, I am active on social media to raise awareness about the importance of these often-neglected senses. Topics that I focus on include the need for:

- Increased education for individuals and clinical providers about how taste and smell contribute to health and well-being
- Screening and comprehensive testing for olfactory disorders across health care disciplines
- Clinical standards to guide clinicians in addressing olfactory-related issues
- Multidisciplinary treatment approaches for olfactory disorders

4. *Why do you see outreach as integral to your work?*

Engaging with the wider community through social media and speaking opportunities is a passion of mine. As scientists, we have power through writing and speaking. As part of my own journey, my commitment extends beyond the laboratory. It's not just about sharing the latest scientific findings. It's also about making science accessible, promoting health equity, and inspiring the next generation of scientists. In an era where misinformation can spread rapidly, providing accurate, accessible scientific information is crucial.

I aim to bridge the gap between the scientific community and the public, making science more approachable and understandable. I hope to demystify the complexities of sensory science and its intersection with health and health disparities. Working with diverse audiences not only educates but also empowers individuals, enabling them to make informed decisions about their health and well-being.

Moreover, I think that these platforms can be leveraged to mentor and create community, especially for underrepresented minorities. Sharing our scientific journey is as important as sharing the science itself. The path to becoming a scientist is fraught with challenges, failures, and successes. In relaying my experiences—from my initial fascination with taste and smell, through the rigorous training, to my current research—I hope to inspire and encourage emerging researchers to see that science is a journey of discovery, resilience, and continuous learning.

5. *Can you share what you like to do when you're not at work?*

Outside my professional life, I love to travel, especially to places with lots of history, where I can imagine myself in past eras. My South American body loves the sun and the beach—escaping to nature brings me joy. Whether it's spending time with my beautiful family, immersing myself in silent (or not) meditation retreats, or simply enjoying the company of friends, these moments away from work are vital. They not only offer me a respite but also often spark creativity and bring fresh perspectives to my research.